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ORIGINAL ARTICLE

GRADUATING RURAL HOUSEHOLDS AS MODEL FAMILIES HAS INCREASED LATRINE UTILIZATION IN WEST GOJJAM ZONE, AMHARA REGION, ETHIOPIA

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ABSTRACT

Background: *Since 2003, Ethiopia has launched a nationwide primary health initiative known as the Health Extension Program at the grassroots level in order to increase public access to basic health services. The program was designed to increase the coverage of primary health care services, mainly by producing model households. This study assessed whether households that fully implemented the Health Extension Program have adopted latrine utilization.*
Methods*: A cross-sectional community-based survey was conducted to collect data from 1320 mothers. A multistage sampling technique was used to select study participants, using a structured questionnaire and observation checklist. A multivariate logistic regression was used to identify the predictors of latrine utilization. A propensity score analysis was used to determine the contribution of the Health Extension Program model to households on latrine utilization.*
Result: *The overall latrine utilization was 83.5% (87.0% in model households, 72.1% in non-model households). Model households in the Health Extension Program (AOR = 2.39; 95% CI = 1.70 to 3.35) were more likely to utilize latrines compared to non- model households. The former contributed to 19.80% (t = 4.50) of the increase in latrine utilization. In addition, households obtained more frequent home visits (AOR = 1.45; 95% CI = 1.04, 2.01), whose mothers identified at least one benefit of using the latrine (AOR = 3.49; 95% CI = 2.34, 5.20), headed by married couples (AOR = 1.64; 95% CI = 1.03, 2.63), and who were large in size (AOR = 1.39; 95% CI = 1.01, 1.91) were more likely to utilize latrines than the reference groups.*
Conclusion: *Latrine utilization was found to be relatively high, especially among model households. Being models, frequent HEW visits, and knowledge about the benefits of latrine were found to be the predictors of latrine utilization. When implemented fully, the Health Extension Program could help to step up latrine utilization and improve the status of sanitation and hygiene in rural communities.*

Key Words: *rural households, model family, latrine utilization*

BACKGROUND

Community Health Workers (CHWs) improve access and increase the utilization of primary health care by serving as a bridge to link clients in need, health care, and human services (1, 2).

In many African countries, CHWs have fulfilled generalist health functions, and evidence suggested that they have increased the coverage of a range of services that include hygiene and sanitation over the last 30 years (3-6). Home services by CHWs and other community health programs to promote hygiene and sanitation as well as maternal and child health have been implemented in different countries and showed encouraging results (7-10).

The Government of Ethiopia has implemented the Health Extension Program (HEP) since 2003 to improve primary health coverage at the grassroots level (11). The center for the HEP activity is the health

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post (HP), a lower level health facility in the national health referral system or national health care tier system. The HP, constructed to serve about 5000 people, is located in each smallest administrative unit (kebele) of the country, staffed by two female health extension workers (HEWs) though the number sometimes varies from kebele to kebele depending on the size and topography of the kebele; male HEWs are also deployed in HPs in regions like Gambella. The HEWs train for one year and receive a regular salary from the government (12, 13).

The HEP has 16 packages under disease prevention and control, family health, hygiene and environmental sanitation, health education and communication services. It is designed to increase the coverage of primary health care services in Ethiopia, mainly by producing model households through model-family trainings. The model family training comprises a total of 96 hours of training on basic hygiene and environmental sanitation (30 hours), family health care (42 hours), and disease prevention and control (24 hours). Households that attend at least 75% of the training and implement at least 75% of the HEP packages receive certificates of completion at organized ceremonies and graduate as model households (families). The program also addresses health service utilization through the establishment of HP to serve 5000 people and the deployment of two HEWs who conduct community home visits and give basic health services in each HP.

Studies on the effects of the HEP in Ethiopia indicated that the program has had a tangible effect on BCG (Bacille-Calmette-Guérin vaccine against tuberculosis), DPT3 **(**third dose of Diphtheria-Pertussis -Tetanus vaccine) and increased TT2 (2^{nd} dose of tetanus toxoid vaccine). Likewise, access to sanitation was significantly higher (90%) among model-family households than households who had not yet participated in model-family training and achieved 67%; and overall access to improved toilet facilities was 66.4%. Access to toilet facility in Amhara, Oromia, and SNNP regions showed a significant improvement from 2005-2010, that is, from 40.5% and 58.2% in 2005 and 2007, respectively, to 68% in 2010. In addition, during the HEP implementation period, particularly as of 2007, other basic health service indicators such as contraceptive acceptance, antenatal care utilization, full immunization, and TT2 and above coverage markedly rose from 34.8 to 61.7%, 52.1 to 82.2%, 56.4 to 74.5%, 25.8% to 43.6%, respectively (14-16).

Other studies on the HEP indicated statistically significant access to toilet facilities among households that graduated as model families compared to their counterparts, indicating the effectiveness of the model-family approach in modifying behaviour towards adopting hygiene. The significant contribution of the HEP to the availability of latrines in rural Ethiopia was also documented in other studies that commented on sustaining the constructed latrines, monitoring their quality, and encouraging use (14, 15, 17).

However, previous studies mainly focused on assessing latrine accessibility rather than its utilization by communities. Therefore, this study aimed at assessing whether or not the HEP model households in Ethiopia have been better users of the latrine.

METHODS

A community-based cross-sectional study was conducted among mothers in 1320 households drawn

from 44 kebeles over three months (March - May, 2012). Mothers and children were the most accessible members of households during the house-to-house visits. Besides, the focus of the HEP is women as female HEWs are culturally more acceptable than males in family health-related interactions (18). The kebeles were randomly selected from six districts (Yilmana Densa, Mecha, Semien Achefer, Bure, Jabi Tehnan, and Dega Damot) in West Gojjam Zone, the Amhara National Regional State, Ethiopia. Out of the 6,530 HEWs (6,401 rural, 129 urban) in the region, 782 HEWs (772 rural, 10 urban) in the zone and 368 HEWs in the selected districts were implementing the HEP during the study.

The sample size was determined by using the single population proportion formula. The computation was based on 95% confidence interval ($Z_{\alpha/2}$ = 1.96), 5% marginal error (d), and 50% latrine utilization (p) by the community, and a 10% non-response rate.

$$n = \frac{Z_{\alpha/2}^2\, p\,(1-p)}{d^2} = \frac{(1.96)^2\,(0.50)\,(0.50)}{(0.05)^2} = 384$$

by adding 10%, n=384+10/100(384)=423 households The sample, (423) was multiplied by the design effect of 3 (number of stages), and the final sample size was 1269, which was again, raised to 1320 in order to take 30 households from each kebele.

A multistage sampling procedure was used to select the population. At the first stage, six districts were randomly selected from the 13 rural districts in the study administration zone. At the second stage, 44 kebeles out of 184 were selected randomly from the six districts. In the third stage, 30 households were selected randomly from each kebele to get 1320 mothers required for the study.

Data were collected using a structured questionnaire and observation checklist. Twelve data collectors and six supervisors were recruited and trained to administer the questionnaire. The structured questionnaire was pre-tested in kebeles which were not included in the actual study in the same administrative zone. The pre-test was done on 5% of the study participants, and the questionnaire was assessed for completeness, clarity, and length before the survey.

Data Measurement: The quality of services was measured according to participants' perception of services provided in the HP using a 5-points Likert scale ranging from 1 (very bad) to 5 (very good). Frequent visits of households by HEWs is defined as at least one visit every 4 weeks.

Latrine utilization was confirmed by asking the participants whether family members were using the latrine or not, and by checking the availability of latrines for household use, the presence of a clear pave from the house to the latrine, and the absence of faeces in the surrounding (4).

Data Analysis: Data were entered into Epi-Info 3.5.1 and transferred to SPSS 16 for binary logistic regression analysis, were transferred to STATA 12 for propensity score analysis. Multivariate logistic regression was used to control confounding factors, and to look for associations between explanatory and outcome variables. We checked all variables in the bivariate model independently, and selected the variables which were significant at p-value <0.2 to be included in the final model. Marital status, family size, mothers' occupation, income, frequency of home visits by HEWs, knowledge of benefit of excreta disposal, and household graduation status were included in the final model. Hosmer-Lemeshow (H-L) goodness-of-fit was used for checking model fit. If the H-L goodness-of-fit test statistics were greater than 0.05, the estimates of the model fitted the data at

an acceptable level.

Propensity score analysis was conducted to determine the effect of the HEP model households on latrine utilization in the community. Nearest neighborhood matching was used in the analysis that matched a given treated subject to an untreated subject whose propensity score was closest to that of the treated subject or vice versa. The method was used to balance the intervention and control units so that direct comparison would be possible for evaluating the effect of HEP model households on latrine utilization. The average treatment effect on treated (ATT) model households was computed by averaging the difference between the outcome of the model households and that of non-model households.

Ethical issues: The University of Gondar Ethics Review Committee approved the research proposal. A written informed consent was obtained from each study participant. Personal identifiers of respondents were not taken to ensure confidentiality. The respondents were also informed of their freedom to withdraw at any time while they were being interviewed.

RESULTS

Socio-economic and Demographic Characteristics of Participants : A total of 1318 mothers (1006 model, 312 non-model households) participated in the study with a response rate of 99.9%. The mean age of the respondents was 32.53±6.25 years. Out of the study participants, 90.1% were married, 74.2% illiterate, 79.0% housewives, 99.3% Amhara, and 100% Orthodox Christians. The average family size was 5.53±1.79 individuals. The average monthly income of the households was 887.90±587.632 Ethiopian Birr (ETB) (Table 1). Among the study participants, 91.9% were aware of the HEP, 94.7% viewed the conduct of HEWs as ‘‘good’’, 94.4% rated the health services provided at the HPs as of ‘‘good quality’’, 78.5% visited HPs during the year, 84.2% had home visits by HEWs, 52.7% had frequent visits (at least one visit every 4 weeks), and 76.3% were from model households (Table 2).

Latrine Utilization: The study indicated that 86.7 % households (90.3% model households, and 75.3% non-model households) had latrines. In addition, 83.5% of households (87.0 model households and 72.1% non-model households) utilized latrines (Table 3).

Factors Affecting Latrine Utilization: Model households, households with more frequent home visits, and those in which mothers identified at least one benefit of using latrines were 2.39 (AOR = 2.39; 95% CI = 1.70, 3.35), 1.45 (AOR = 1.45; 95% CI = 1.04, 2.01), and 3.49 (AOR = 3.49; 95% CI = 2.34, 5.20) times more likely to utilize latrines compared to non-model households, households with less frequent visits, and households in which mothers could not identify the benefits of latrines, respectively. In addition, households of married couples, and those with large family sizes were 1.64 (AOR = 1.64; 95% CI = 1.03, 2.63), and 1.39 (AOR = 1.39; 95% CI = 1.01, 1.91) times more likely to utilize latrine compared to households with single or divorced or widowed mothers, and households with less family sizes, respectively (Table 4).By statistically balancing 1006 HEP model households (intervention group) and 312 HEP non-model households (matched control group) based on the propensity scores and all the variables used to construct it, the ATT of the model households was found to be 0.198 points (t = 4.497) for latrine utilization that indicated HEP model households contributed 19.80% increase to latrine utilization compared to HEP non-model households (Table 5).

Table 1: Socio-economic and demographic characteristics of participants, West Gojjam Zone, Ethiopia, 2012

Variables	Total Households		Model Households		Non-model Households	
	Number	Percent	Number	Percent	Number	Percent
Age						
24 and below	115	8.8	65	6.5	50	16.3
25 - 34	659	50.3	495	49.3	164	53.6
35 and above	535	40.9	443	44.2	92	30.1
Total	1309	100	1003	100	306	100
Marital Status						
Single	92	7.0	68	6.7	24	7.7
Married	1187	90.1	905	90.0	282	90.4
Separated	11	0.8	9	0.9	2	0.6
Widow	4	0.3	4	0.4	-	-
Divorced	24	1.8	20	2.0	4	1.3
Total	1318	100	1006	100	312	100
Education						
Illiterate	978	74.2	728	72.3	250	80.1
Read and write	215	16.3	192	19.1	23	7.4
Grade 1-6	81	6.1	61	6.1	20	6.4
Grade 7-8	24	1.8	15	1.5	9	2.9
Grade 9-12	16	1.2	7	0.7	9	2.9
University	4	0.3	3	0.3	1	0.3
Total	1318	100	1006	100	312	100
Occupation						
Housewife	1041	79.0	770	76.5	271	86.9
Farmer	258	19.6	224	22.3	34	10.9
Other	19	1.4	12	1.2	7	2.2
Total	1318	100	1006	100	312	100
Income(Eth. Birr)						
562 and below	331	25.1	204	20.3	127	40.7
563-760	330	25.0	257	25.6	73	23.4
711-960	353	26.8	276	27.4	77	24.7
961 and above	304	23.1	269	26.7	35	11.2
Total	1318	100	1006	100	312	100
Family Size						
2-3	162	12.7	104	10.6	58	19.9
4-5	495	38.9	389	39.6	106	36.3
6-7	435	34.1	345	35.1	90	30.8
8 and above	182	14.3	144	14.7	38	13.0
Total	1274	100	982	100	292	100
Ethnicity						
Amhara	1309	99.3	999	99.3	310	99.4
Agew	9	0.7	7	0.7	2	0.6
Total	1318	100	1006	100	312	100

Table 2: Study Participants' health extension program related status in West Gojjam Zone, Ethiopia, 2012

Variables	Total Households		Model Households		Non-model Households	
	Number	Percent	Number	Percent	Number	Percent
Heard about HEP (1318)						
Yes	1211	91.9	1006	100	205	65.7
No	107	8.1	-	-	107	34.3
Total	1318	100	1006	100	312	100
Sources of information (1211)						
HEWs	1190	98.3	992	98.6	198	96.9
Other Health Workers	251	20.7	190	18.9	61	29.8
Community	217	17.9	170	16.9	47	22.9
Radio	56	4.6	35	3.5	21	10,7
Understanding HEP Components(1211)						
Yes	890	67.5	746	74.2	144	46.2
No	428	32.5	260	25.8	168	53.8
Total	1318	100	1006	100	312	100
Which HEP do you know?						
Immunization	840	63.7	701	69.7	139	44.6
Excreta disposal	828	62.8	690	68.6	138	44.2
Family planning	827	62.7	685	68.1	142	45.5
Solid and liquid waste disposal	813	61.8	692	68.8	121	38.8
Food supply and safety measures	795	60.3	667	66.3	128	41.0
Personal hygiene	785	59.6	649	64.5	136	43.6
Water supply and safety measures	741	56.2	626	62.2	115	36.9
Health house environment	737	55.9	612	60.8	125	40.0
Malaria	694	52.7	555	55.2	139	44.6
Maternal and child health	572	43.4	470	46.7	102	32.7
HIV/AIDS, Other STD and TB	455	34.5	350	34.8	105	33.7
Nutrition	396	30.0	343	34.1	53	17.0
Adolescent reproductive health	347	26.3	299	29.7	48	15.4
Insect and rodent control	313	23.7	277	27.5	36	11.5
First aid	196	14.9	179	17.8	17	5.4
Community Perception about the conduct of HEWs						
Good	1248	94.7	954	94.8	294	94.2
Bad	70	5.3	52	5.2	18	5.8
Total	1318	100	1006	100	312	312
Community Perception about the quality of services in the HP						
Good	1244	94.4	954	94.8	290	93.0
Bad	74	5.6	52	5.2	22	7.0
Total	1318	100	1006	100	312	312
Home Visits by HEWs						
Yes	1110	84.2	929	92.3	181	58.0
No	208	15.8	77	7.7	131	42.0
Total	1318	100	1006	100	312	100
Frequency of Home Visits by HEWs						
No visits or less frequent visits	623	47.3	420	41.7	203	65.1
More frequent visits (at least one visit every 4 weeks)	695	52.7	586	58.3	109	34.9
Total	1318	100	1006	1006	312	100
Health Post Visits by the Community						
Yes	1034	78.5	831	82.6	203	65.1
No	284	21.5	175	17.4	109	34.9
Total	1318	100	1006	100	312	100

Table 3: Study participants' knowledge and utilization of latrine, West Gojjam Zone, Ethiopia, 2012

Variables	Total Households		Model Households		Non-model Households	
	Number	Percent	Number	Percent	Number	Percent
Have you ever received any information about excreta disposal?						
Yes	1194	85.3	1006	100	188	60.3
No	124	14.7	-	-	124	39.7
Total	1318	100	1006	100	312	100
Who gave you information about excreta disposal? (n = 1124)						
Health Extension Workers	1116	99.3	845	92.9	271	95.4
Community Health Agents	240	21.4	175	19.2	65	22.9
Other Health Workers	289	25.7	176	19.3	113	39.8
Family	79	7.0	51	5.6	28	9.9
Friend	13	1.2	6	0.7	7	2.5
What are the advantages of having excreta disposal system? (n = 1124)						
To prevent disease	973	86.6	761	83.6	212	74.6
To prevent bad smell	697	62.0	585	64.3	112	39.4
To have a clean environment	774	68.9	616	67.7	158	55.6
To keep privacy	277	24.6	212	23.3	65	22.9
Knowledge of Benefit of Excreta Disposal						
Identifying at least one benefit						
Identifying no benefits	1172	88.9	898	89.3	274	87.8
Total	146	11.1	108	10.7	38	12.2
	1318	100	1006	100	312	100
Do you have a latrine?						
Yes	1143	86.7	908	90.3	235	75.3
No	175	13.3	98	9.7	77	24.7
Total	1318	100	1006	100	312	100
What is the type of latrine?						
Pit latrine	1127	98.6	896	98.7	231	98.3
Others (ventilated pit latrine and community latrine)	16	1.4	12	1.3	4	1.7
Total	1143	100	908	100	235	100
Is the latrine functioning?						
Yes	1120	98.0	892	98.2	228	97.0
No	23	2.0	16	1.8	7	3.0
Total	1143	100	908	100	235	100
Do you or your family use latrine?						
Yes	1100	83.5	875	87.0	225	72.1
No	218	16.5	131	13.0	87	27.9
Total	1318	100	1006	100	312	100
Who is using the latrine? (1100)						
Father	1080	98.2	859	98.2	221	98.2
Mother	1066	97.0	846	96.7	220	97.7
Children	808	73.5	675	77.1	133	59.1

Table 4: Factors associated with latrine utilization by the community, West Gojjam Zone, Ethiopia, 2012

Variables	*Latrine Utilization*		*Crude OR (95% CI)*	*Adjusted OR (95% CI)*
	Yes	No		
Marital status				
Single and others	102	29	1.0	1.0
Married	998	189	1.501 (0.966, 2.333)	**1.644 (1.027, 2.630)***
Family size				
Five and below	530	127	1.0	1.0
Six and above	531	86	1.480 (1.097, 1.995)	**1.389 (1.009, 1.913)***
Mothers' occupation				
Farmers and Others	240	37	1.0	1.0
Housewife	860	181	0.733 (0.500, 1.073)	0.774 (0.508, 1.179)
Income (ETB)				
Below mean (less than 888)	678	151	1.0	1.0
Above mean (more than 888)	422	67	1.403 (1.026, 1.917)	1.042 (0.740, 1.468)
Understanding HEP				
No	339	89	1.0	1.0
Yes	761	129	1.549 (1.149, 2.088)	1.183 (0.848, 1.650)
Visiting health post				
No	218	66	1.0	1.0
Yes	882	152	1.757 (1.270, 2.431)	1.335 (0.922, 1.933)
Frequency of home visits by HEWs				
No visits or less frequent visits	489	134	1.0	1.0
More frequent visits	611	84	1.993 (1.480, 2.684)	**1.445 (1.040, 2.009)***
Knowledge of benefits of excreta disposal	91	55	1.0	1.0
Identify no benefits	1009	163	3.741 (2.575, 5.435)	**3.489 (2.343, 5.196)****
Identify at least one benefit				
Household graduation status				
Not graduated	225	87	1.0	1.0
Graduated	875	131	2.583 (1.898, 3.515)	**2.385 (1.701, 3.345)****

*Note: * for p-value < 0.05; ** for P-value < 0.01*

Table 5: Average treatment effect on treated (ATT) HEP model households on latrine utilization by the community, West Gojjam Zone, Ethiopia, 2012

Number of observations = 1318 ***Replications*** = 100						
Dependent Variable	***Model households***	***Non-model Households***	***ATT***	***Std. Error***	***t***	***95% Confidence Interval***
Latrine Utilization	1006	312	0.198	0.044	4.497	(0.111, 0.285)

Note: The numbers of treated and controls refer to actual nearest neighbour matches.

ATT estimation with Nearest Neighbour Matching method

DISCUSSION

The study indicates that 86.7 % households (90.3% model and 75.3% non-model) have latrines; 83.5% of the households (87.0 model and 72.1% non-model) utilize latrines, indicating a finding higher than that of the survey conducted by the Center for National Health Development in Ethiopia to evaluate the Ethiopian Health Extension Program. The survey indicates that 68% of households had latrines and 36.2% utilized them (15). The finding of the study is also higher than that of a study on latrine coverage among rural communities in Bahir Dar Zuria district, Ethiopia, which reports 58.4% (19). This could be due to the fact that more households graduated as models, following the implementation of the HEP.

The study also shows that household graduation status (being model) has significantly contributed to latrine utilization in the community. In terms of latrine coverage, the finding of this study is consistent with previous impact assessment studies that indicate a statistically significant access to toilet facilities among households that graduate as models compared to other households (14, 15, 17). That is because the requirements for graduation include the environmental health package, more specifically latrine construction and the emphasis given to health education by HEWs during the house to house visits. However, this study has noted a statistically significant contribution of model households to latrine utilization which has not been reported by previous HEP impact assessment studies (14, 15, 17). This could be due to the difference in the length of time after the implementation of HEP since the impact of the program needs a considerable time to produce an effect.

In the study, households with more frequent home visits by HEWs demonstrate better latrine use. This is consistent with a study in Ethiopia that shows access to health extension services has a significant influence on individual decisions to utilize sanitation and hygiene information (5). In another study in Ethiopia, the frequency of home visits is significantly associated with the availability of latrines, indicating households more frequently (at least three times) visited by health professionals are more likely to have latrines compared to households that received no visits (19).

This could be due to the intensity of the information regarding HEP packages provided by HEWs. This can be substantiated by a meta-analysis of home visit programs to families at risk to examine differences in the effects of programs on maternal behaviour, which notes that the effectiveness of home visit programs is principally dependent upon the frequency of services, showing that programs with more frequent contacts between home visitors and their clients are most successful (6). In contrast, some systematic reviews of home visit programs found no pattern of difference in the average intensity and duration of the program relating to the outcomes measured (20, 21).

Mothers' adequate knowledge about the benefits of owning latrines leads to more utilization. This is consistent with the result of a study in Ethiopia that shows access to health extension services and perceiving reasons for latrine construction have a significant influence on individual decisions to utilize sanitation and hygiene information and the extent of latrine utilization, respectively (4, 5). Studies in Taiwan and Uganda have also identified that individual and community knowledge and acceptance of health services or health literacy associate with increased health service utilization (22, 23). This could be due

to a rational decision making process on the consequences of not having latrines on the health of the family.

Non- HEP related factors such as marital status and household family size have significant associations with latrine utilization. Households of married couples and large families (six or more) are more likely to utilize latrine compared to single, divorced, or widowed mothers, and households with less families (five and below), respectively. This could be so because the capacity to construct and utilize latrines may be better among households headed by married couples and have more members. However, the assumption needs further research for better evidence.

Limitations of the study: The confirmation of model households and the extent of latrine utilization might not be objective enough, perhaps resulting in misallocations of groups that in turn affect the result of the study. There was lack of baseline information about latrine utilization before the implementation of the HEP, so we could not measure the actual contribution of the program to latrine utilization.

CONCLUSION

The study indicated that latrine utilization was relatively high, especially among model households, and HEP model-households contributed significantly to latrine utilization compared to non-model families. It also showed that frequent home visits by HEWs had a significant association with latrine utilization in the community. Thus, HEWs as well as district, zonal, and regional health officials need to encourage households to participate regularly in the HEP by implementing strategies that enhance their motivation and providing evidence about the positive changes that are occurring in communities. In addition, following up the existing models and producing more by giving model-family trainings to non-model households are crucial in the implementation of the HEP to increase basic health service utilization. Therefore, the study area and other districts and zones in Ethiopia may make efforts to have model households in order to improve HEP utilization in general and latrine utilization in particular.

Competing Interests: The authors declare that they have no competing interests.

Authors' Contributions: MY conceived the study, participated in the design, collection, and analysis of the study, and drafted the manuscript. YB participated in the conceptualization and design of the study and helped to draft the manuscript. AW helped in the design of the study and analysis of the data, and contributed to the drafting of the manuscript. YK also participated in the design of the study and contributed to the drafting of the manuscript. All authors read and approved the final manuscript.

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